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ABSTRACT

This paper analyzes economic trends to determine if education should be the focal point for rural economic development. According to the labor shortage/skills mismatch view, the movement toward a "service economy" will accelerate in the 1990s, increasing the number of skilled jobs and the demand for skilled workers. This "supply-push" theory supposes that demand-side conditions for rural economic development have come into being, and attacks instead the supply-side problem, i.e., the chronic shortage of skilled workers in rural areas. Contrary to this theory, an analysis of Bureau of Labor Statistics employment projections suggests that there will not be an "explosion of skilled jobs" in the 1990s, either nationally or in rural areas. The paper analyzes changes in pay levels, skill requirements, average years of schooling, and educational requirements in the 1970-1988 period and uses them as a point of comparison for estimated future changes. It also compares rural and urban areas. The policy implications of the analysis are that: (1) the most serious obstacle to rural economic progress may be the lack of growth in high-skill jobs and not the skills and education level of the rural workforce; (2) efforts to upgrade worker skills by themselves seem unlikely to pay off since the availability of high-skill jobs will only increase slightly; and (3) rural upgrading only makes sense if coordinated with policies for boosting demand for rural high-skill workers. This paper contains numerous tables. The appendix provides information about the data used in the paper such as industrial and occupational data, pay levels, skill indices, and educational levels. (KS)

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THE MYTH OF THE COMING LABOR SHORTAGE IN RURAL AREAS

by: Ruy A. Teixeira and Lawrence Mishel

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THE MYTH OF THE COMING LABOR SHORTAGE IN RURAL AREAS

By Ruy A. Teixeira and Lawrence Mishel

Introduction

Should more education be the focal point for rural[1] economic development efforts, as much recent discussion has suggested? Analyses of the role of education in rural areas in the 1970s and 1980s strike a note of pessimism in this regard. Killian and Parker (1991) found no significant effect of local educational levels on employment growth in nonmetro areas. Similarly, a very detailed analysis by McGranahan and Ghelfi (1991) suggested that weak demand for educated rural workers has been the major problem, not a poor supply of such workers. A close look at the data, in short, casts doubt on the efficacy of enhanced education, by itself, as a strategy for rural economic development.

Such skepticism is underscored by the fact that rural areas have already upgraded human capital levels dramatically from their very low levels of thirty years ago (the median rural resident in 1960 had only a ninth grade education; the median rural resident today has a high school diploma (McGranahan, Hession, Hines, and Jordan, 1986)). And yet, the 1980s have seen a troubling divergence of economic outcomes between metro and nonmetro areas, despite this enriched stock of rural human capital. This divergence includes rural areas suffering from slower employment growth, higher unemployment, relative and absolute earnings deterioration, higher levels of *under*employment, relative decline in per capita income, and higher poverty rates (Lichter, 1991).

But what if the demand for education were to skyrocket? Enhancing rural educational levels might then become a more viable focus for rural development efforts. In fact, much of the conventional wisdom supports this viewpoint, based on the "labor shortage" or "skills mismatch" view of labor market trends.

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According to the labor shortage/skills mismatch view, the movement toward a "service economy" will accelerate in the 1990s, increasing the number of skilled jobs and the demand for skilled workers. The slow-growing labor force, however, will be increasingly dominated by disadvantaged workforce entrants with low skill levels, as evidenced by recent trends. This *skills mismatch* between available jobs and available workers could handicap the economy.

But (so this conventional wisdom runs) the skills mismatch itself will provide a great opportunity. While minorities and other less educated workers, including rural workers, may now lack the requisite skills to compete in the "new economy," providing them with the education they currently lack will practically guarantee them access to the many high-skill jobs which will be created.

Whatever its merits, this has become a popular story, as witnessed by numerous press accounts (for example, *Business Week*, Sept. 19, 1988, "Needed: Human Capital"; or *Wall Street Journal*, Feb. 9, 1990, "Education: The Knowledge Gap"). It has also been the view of the U.S. Department of Labor under Presidents Reagan and Bush, a view based on the widely disseminated *Workforce 2000* report, prepared by the Hudson Institute for the Labor Department (Johnston and Packer, 1987). This report establishes the context for almost all policy discussions of education and training.

The application of this viewpoint to rural areas is straightforward. Since the skills required for jobs are rapidly increasing, and since rural workers tend to have relatively low educational levels, the skill levels of rural workers must be upgraded to match the skill levels of available jobs. Then, once the "human capital" of rural workers is adequately upgraded, rural economic development will follow, since employers will be actively seeking supplies of skilled labor.

One might call this the "supply-push" theory of rural economic development. It presupposes that demand-side conditions for rural economic development are coming into being, and attacks instead the supply-side problem, the chronic shortage of skilled workers in rural areas. Continuing shortages, the thinking goes, will hinder rural economic development by keeping skill-hungry employers from expanding operations or moving in from other areas.

Contrary to this theory, our analysis of Bureau of Labor Statistics employment projections suggests that there will not be an "explosion of skilled jobs" in the 1990s, either nationally or in rural areas. More specifically:

- In the 1970s, the skill and education requirements of jobs grew far faster in rural than in urban areas. In the 1980s, however, job-skill requirements in rural areas grew only half as fast as in urban areas and only one-third as fast as in rural areas in the 1970s.
- Job-skill requirements in rural areas will grow in the 1990s at a much slower rate than in the 1970s, in both our optimistic and our pessimistic scenarios, and may match the disappointing performance of the 1980s.
- The 1990s are likely to see a further shift toward lower paying jobs for noncollege-educated rural workers.
- Skill and education requirements grew more slowly in the 1980s than the 1970s because of the lesser growth of skills demand in rural areas. Employment projections imply an even further *slowdown* in skills demand in the 1990s, slowing to a rate just one-third that of the 1970s.
- Job shifts led to higher compensation in the 1970s and 1980s but will lower compensation in the 1990s. In rural areas, however, structural employment shifts strongly raised pay in the 1970s but lowered it in the 1980s, a trend expected to continue in the years ahead.

The policy implications of our analysis are that:

- The most serious obstacle to rural economic progress may be the lack of growth in high-skill jobs and not the skill and education level of the rural workforce.
- Efforts to upgrade worker skills by themselves seem unlikely to pay off since the availability of high-skill jobs in rural areas will only increase slightly.
- As a result, rural educational upgrading only makes sense if coordinated with policies for boosting demand for rural high-skill workers. Raising demand for skills is a challenge facing the nation as a whole and not just rural areas.

Assessing Trends in Skill Requirements

To know whether there will be a "skills mismatch" requires, first and foremost, an assessment of the skills required for the jobs that one anticipates will be available. In order to do this, we examine the changes in skill requirements implicit in the 1988-2000 BLS employment projections.[2] However, to know whether the expected increase in skill requirements is "explosive," large, or just modest, a yardstick is also needed. Thus, we will also analyze the changes in skill requirements in the 1970-1988 period and use them as a point of comparison for estimated future changes. Finally, we will also examine changes in the pay levels of jobs over these same time periods, since a key component of the skills mismatch viewpoint is that strong growth in job-skill requirements will generate strong upward pressure on wages.

To analyze the characteristics of jobs (both skill requirements *and* pay), and how they are changing over time, we classify changes in the job structure along three dimensions. First, job characteristics are partially driven by changes in the *occupational composition* of employment, such as a shift from manual to technical/professional jobs. Since jobs within a particular occupation will differ depending on the industry to which it is attached, a second important dimension is the *industrial composition* of employment.

The last dimension is changes in the *skill content* or pay level of work in a particular occupational/industrial category. This dimension reflects, for instance, the degree to which the skill level of supermarket cashiers, blue-collar manufacturing workers, or stock

TABLE 1
Pay and Education Level by Occupation and Industry, 1988

Occupation	Goods Producing	Service Producing	All Sectors
Executive, Technical, Professional			
Employment Share	4.1%	21.9%	26.0%
Hourly Compensation	$26.45	$22.16	$23.10
Mean Education (years)	14.7	14.9	14.8
Clerical/Sales			
Employment Share	3.4%	27.0%	30.4%
Hourly Compensation	$13.75	$11.46	$11.80
Mean Education (years)	13.0	13.0	13.0
Blue Collar			
Employment Share	16.1%	11.1%	27.2%
Hourly Compensation	$15.46	$12.82	$14.35
Mean Education (years)	11.4	11.7	11.5
Service			
Employment Share	0.3%	16.1%	16.4%
Hourly Compensation	$13.24	$7.01	$7.16
Mean Education (years)	10.9	11.5	11.5
All Occupations			
Employment Share	23.9%	76.1%	100.0%
Hourly Compensation	$17.21	$13.12	$14.28
Mean Education (years)	12.2	13.0	12.8

Source: Tabulations of Current Population Survey Earnings File (1988) for private nonagricultural wage and salary workers. Pay data from Employment Cost Index, March 1989.

brokers grows over time. (As it turns out, changes in the *skill content* of particular jobs are probably the most important -- certainly the hardest to measure -- dimension of the job structure.)

These dimensions of the job structure are illustrated in Table 1, where the private economy is divided into two industrial sectors -- goods production and service production -- and four occupations. The skill requirements of jobs are proxied in this table by the educational level of the workers in the particular occupational/industrial category, while pay levels are represented by average hourly compensation.

As demonstrated in Table 1, professional/technical jobs require more education and provide higher pay than jobs in other occupations. Generally, the educational levels of occupations are roughly the same in each industrial sector. Because of a greater proportion of technical/professional jobs, the educational requirements of service sector jobs as a whole are somewhat higher (13 years versus 12.2 years).

However, regardless of occupation, goods production jobs pay much better than service production jobs. Consequently, shifts in both the *occupational* and *industrial* composition of jobs will affect skill requirements and pay levels. Interestingly, as we will stress below, a shift of jobs to occupations requiring more education -- such as from blue collar to clerical/sales jobs -- can lead to a *more* educated workforce that is paid *less*, especially if the shift is also from goods to service production.

Finally, changes in the third dimension, *skill content*, should be considered as changes over time in the skill levels within the eight industrial/occupational categories.

This three-dimensional framework is applied in the next several sections to examined past and expected changes in skill requirements and pay. In particular, we perform detailed analyses of the effect of occupational and industrial change (using a twenty-three by twenty-three occupation/industry matrix) on seven different measures of skill requirements as well as on various measures of educational requirements and wage and compensation levels.[3] In addition, evidence on shifts in job content (to the extent permitted by data limitations) is reviewed to shed light on the third possible dimension of change outlined above.

National Trends in Skill Upgrading

The supply-push theory that touts education as the key to rural economic development is built on the premise that the nation is, in fact, moving rapidly into a high-

skill economy. However, data on historical trends in job-skill requirements undermine this premise.

A recent study analyzed the effects of both industry and occupation shifts on job-skill levels from 1960 to 1985 in 267 occupations and sixty-four industries (Howell and Wolff, 1991). It found that, while structural upgrading of job skills took place in each decade, *the rate of upgrading declined substantially over time.* For example, the "substantive complexity" of jobs went up 0.69 percent per year in the 1960s, 0.46 percent per year in the 1970s, and only 0.28 percent per year in the 1980s. These results hardly suggest an impending explosion of skills upgrading from structural change.

TABLE 2
The Effect of Industry and Occupation Employment Shifts on Skill and Education Requirements and Pay, 1970-2000

Job Characteristic	1970-79	1980-88	BLS Projections 1988-2000
		(Ten-Year Rate of Change)*	
Pay Levels			
Hourly Wage	2.5%	1.5%	0.3%
Weekly Wage	2.8	1.5	0.2
Hourly Compensation	2.0	0.6	-0.0
Weekly Compensation	2.2	0.6	-0.2
Skill Indices			
General Education Development (GED)	2.3%	2.0%	0.8%
Numerical Aptitude	1.5	1.7	0.5
Verbal Aptitude	2.3	2.1	0.8
Intellectual Aptitude	2.3	2.0	0.8
Handling Data	4.0	4.3	1.4
Handling People	2.2	1.9	0.7
Handling Things	-1.4	-2.1	-0.4
Education			
Average Years of Schooling	1.4%	1.1%	0.5%
		(Percentage Point Change)	
Shares of Employment Requiring:			
Less Than High School	-1.4%	-0.9%	-0.4%
High School Graduate	-1.3	-1.9	-0.7
Some College	0.6	0.6	0.3
College Graduate or More	2.2	2.0	0.8

* To facilitate comparisons of these time periods which are of different length the data have been converted to ten-year rates of change: the change if the annual rate of change in these time periods had continued for ten years.

If these trends continue, structural upgrading of job-skill requirements in the 1990s should be *less* than in the two previous decades. This expectation was confirmed by our comparison of historical changes in skill levels (1970-1988) with projected changes in skill levels (1988-2000). These data are displayed in Table 2, for the full range of skill, education, and pay measures we investigated.

These data show that, contrary to the conventional wisdom on national skill trends, the move to a "service economy," in and of itself, is not likely to produce a highly skilled job structure. This is because industrial and occupational upgrading trends are not large enough to generate a substantial rise in job-skill levels. Furthermore, projected rates of structural upgrading actually appear to represent a substantial *slowdown* from upgrading trends in the past, trends that were themselves fairly modest.

For example, job-skill levels as measured by the verbal aptitude index went up at a ten-year rate of 2.3 percent between 1970 and 1979 and 2.1 percent between 1980 and 1988, but are projected to rise in the 1990s at a rate less than two-fifths the 1980-88 rate (and only about one-third the 1970-79 rate). The other skill and education measures generally show a similar pattern: modest rates of change in the 1970s, a slight deceleration in the 1980s[4] (consistent with Howell and Wolff's data), and then dramatically smaller rates of change in the 1990s. The trend line in these data flatly contradict the popular notion that structural upgrading of jobs will produce a future explosion in job-skill requirements.

It is worth noting that these results are even stronger when we consider the effects of structural change on pay levels. The deceleration in growth rates from the 1970s to the 1980s is sharper, while the growth rates in the 1990s represent an even more dramatic drop from previous decades. Specifically, the rates for wage growth are only about one-fifth to one-seventh the 1980s rates, while the rates for *compensation* growth (wages plus fringes) actually become *negative* (i.e., the effect of structural upgrading on compensation will be to *decrease*, not increase, compensation). This suggests that the economic benefits stemming from future changes in the job structure are also considerably overrated.[5]

Comparing Rural and Urban Trends in Skill Upgrading

These results weaken the case for an education-based, supply-push theory of rural development. If we are not moving into a high-skill economy on the national level, general demand-side conditions appear not to favor a supply-driven rural development policy. Indeed, these results suggest that relatively weak demand for skilled workers

might hold back rural development efforts, even if the supply of such workers in rural areas were substantially increased, as the supply-push approach advocates.

The supply-push approach to rural development may still make sense, but only if demand-side conditions for growth in skilled jobs are better in rural areas than this national picture suggests. By comparing rural and urban skill requirement growth on the same set of indicators, we were able to examine this issue. We also examined this growth under different scenarios to reflect the possibility of different relationships between rural and urban job growth in the 1990s.

Under the first scenario, we assumed that growth rates in occupation/industry categories will be identical across rural and urban areas (for example, managerial-administrative positions in the finance, insurance, and real estate sector will grow as fast in rural as in urban areas). This is probably an optimistic assumption, given historical rural disadvantages in generating high-skill jobs.

The results for metro areas alone are fairly similar to the national trends (see Table 3). They show modest growth in skill requirements in the 1970s, comparable or slightly slower growth in the 1980s,[6] and then a dramatic plunge in skill growth rates in the 1990s (under the equal growth scenario), to levels one-half or less those of earlier decades. For example, the average years of required schooling went up at a ten-year rate of 1.3 percent in the 1970s, slowed slightly to 1.2 percent in the 1980s, and are projected to drop to just 0.5 percent growth for the 1988-2000 period, about 40 percent of the rate in the previous two decades.[7] This hardly suggests that skill-hungry metro employers will be driven to rural areas to find skilled workers, even if such workers were widely available there.

Table 3 also shows the same set of results for rural areas. The historical data here are particularly interesting. In the 1970s, the decade of the "rural turnaround," rural growth rates in job-skill requirements generally exceeded those in urban areas. For example, verbal aptitude and general educational development grew at ten-year rates of 2.9 percent in rural areas, compared with 2.2 percent in urban areas.

This relationship changed dramatically in the 1980s. Rural areas experienced a tremendous slowdown in growth of job-skill/skill indices requirements -- rates falling to only about one-third those in the previous decade -- in contrast to urban areas where job-skill growth maintained its prior growth. For example, growth in GED skill requirements fell from a ten-year rural rate of 2.9 percent in the 1970s to 1.1 percent in the 1980s, while intellectual aptitude skill requirements fell from 2.9 percent to just 0.9 percent. For those

TABLE 3
Comparing Metro and Nonmetro Growth in Job-Skill and Education Requirements and Pay, 1970-2000

					1988-2000 Based on BLS Projections					
	(1)		(2)		(3) Equal Growth Scenario		(4) 1970s Growth Scenario		(5) 1980s Growth Scenario	
	1970-1979		1980-1988							
Job Characteristic	Metro	Nonmetro	Metro	Nonmetro	Metro	Nonmetro	Metro	Nonmetro	Metro	Nonmetro
	(Ten Year Rates of Change)*									
Pay Levels										
Hourly Wage	2.3%	3.3%	2.0%	-1.4%	0.3%	0.1%	0.4%	0.8%	0.5%	-0.7%
Weekly Wage	2.7	3.5	2.2	-1.9	0.2	-0.1	0.3	0.6	0.4	-1.0
Hourly Compensation	1.8	3.0	1.2	-2.0	-0.0	-0.3	-0.0	0.4	0.1	-1.0
Weekly Compensation	2.0	3.1	1.3	-2.5	-0.1	-0.5	-0.1	0.2	0.1	-1.3
Skill Indices										
General Educational Development (GED)	2.2%	2.9%	2.2%	1.1%	0.7%	0.9%	0.8%	1.3%	0.8%	0.5%
Numerical Aptitude	1.4	2.0	1.8	0.7	0.5	0.5	0.5	1.0	0.6	0.2
Verbal Aptitude	2.2	2.9	2.2	1.0	0.8	0.8	0.8	1.4	0.9	0.4
Intellectual Aptitude	2.2	2.9	2.2	0.9	0.7	0.8	0.7	1.3	0.8	0.4
Handling Data	4.0	4.7	4.7	1.9	1.3	1.4	1.3	2.2	1.5	0.6
Handling People	2.2	2.3	2.0	0.9	0.6	0.8	0.7	1.0	0.7	0.4
Handling Things	-1.7	-0.6	-2.3	-1.5	-0.4	-0.4	-0.5	-0.1	-0.4	-0.2
Education										
Average Years of School	1.3%	1.9%	1.2%	0.4%	0.5%	0.6%	0.5%	0.9%	0.5%	0.3%
	(Percentage Point Change)									
Shares of Employment Requiring										
Less than High School	-1.2%	-2.4%	-0.9%	-0.4%	-0.3%	-0.6%	-0.3%	-1.2%	-0.3%	-0.4%
High School Graduate	-1.6	-1.1	-2.0	-0.6	-0.7	-0.5	-0.8	-0.5	-0.8	-0.1
Some College	0.6	1.1	0.6	0.8	0.3	0.4	0.2	0.8	0.3	0.3
College Graduate or more	2.2	2.2	2.4	0.4	0.8	0.8	0.9	0.9	0.9	0.2

* To facilitate comparisons of these time periods which are of different length the data have been converted to ten-year rates of change: the change if the annual rate of change in these time periods had continued for ten years.

Source: Authors' calculations.

same indicators, growth in job-skill requirements in urban areas stayed the same between the two decades. The historical data, then, tell us that demand-side conditions for growth in skilled jobs, not great even in urban areas, have weakened much more rapidly in rural areas.

And the future is not likely to be any better. The data in the middle columns of Table 3 show that, even under the basically optimistic scenario of equal occupation/industry growth rates across rural and urban areas, the 1990s hold little promise of an explosion of skill demand in rural areas. Indeed, future rural growth in job-skill levels under this optimistic scenario will actually represent a *slowdown* relative to historical growth rates: a modest one[8] when compared to the extremely low-growth 1980s; a substantial one when compared to the relatively high-growth 1970s (or even urban growth rates from the 1980s). For example, GED is projected to grow in rural areas at a ten-year rate of just 0.9 percent in the 1990s, compared to 1.1 percent in the 1980s and 2.9 percent in the 1970s (2.2 percent in urban areas in the 1980s). Most of the other measures show a similar pattern.

Thus, even under generous assumptions, rural areas appear unlikely to generate the demand-side conditions upon which an education-based supply-push strategy could be based. Instead, the demand-side conditions themselves appear to be a serious problem.

Nor does the situation improve much under different growth assumptions (in fact, it could conceivably get much worse). This is illustrated by columns 4 and 5 in Table 3, which display data for growth in skill requirements, 1988-2000, under two alternative scenarios. Under these scenarios, we assume that growth in occupation/industry categories in rural and urban areas will be distributed not equally, as in our first scenario, but according to patterns in the last two decades.

The first alternative scenario (column 4) assumes that rural-urban growth among industry/occupation categories will be distributed as in the 1970s, the decade of the rural turnaround (Table 2, column 3). Under this extremely optimistic scenario, the future rate of growth of skill requirements in rural areas, while a slight improvement over the extremely low growth of the 1980s, still does not come close to the estimated historical growth rates in rural areas in the 1970s. This suggests that future growth in rural job-skill levels, even under the most propitious of circumstances, will be rather sluggish -- hardly amounting to an explosion of skill demand for which large numbers of skilled workers must be supplied.

And the situation could be worse. The much more pessimistic but probably more realistic scenario, which assumes that rural-urban growth will be distributed as in the immediate past (i.e., as it was in the 1980s), projects anemic growth in skill requirements of rural jobs (Table 3, column 5). GED requirements, for example, are projected to grow at a ten-year rate of 0.5 percent, while numerical aptitude requirements are projected to grow by only 0.2 percent. It is hard to see how an exclusively supply-push strategy for rural development would make much sense in an environment where demand for such worker skills is so weak.

Table 3 also shows the estimated effects of structural change on the economic benefits (i.e., wages and compensation) received by workers. These results are even stronger than those presented for skill requirements, especially as they pertain to rural areas. Most dramatically, these results show that industrial and occupational change in rural areas in the 1980s did not just *slow* the growth of wages and compensation, it actually *reduced* it. For example, while industrial/occupational change in rural areas increased weekly wages at a ten-year rate of 3.5 percent in the 1970s, the effect of such change in the 1980s was to *lower* weekly wages by 1.9 percent. The other pay level measures show a similar pattern.

Future growth will do little to remedy this situation. Under both the equal growth and 1980s scenarios, the projected effects of structural change on pay levels are still negative, while, even under the very optimistic 1970s scenario, the projected effects are only weakly positive and far below historical rates from the 1970s. This suggests that rural workers are unlikely to reap substantial economic benefits from future changes in the job structure. On the contrary, it appears that future weak demand for worker skills in rural areas, as described above, is likely to be accompanied by downward pressure on pay levels from industrial/occupational change.

The seriousness of these results for rural areas is underscored by data in Tables 4, 5, and 6. These data break down the changes described above by two basic types of workers, production/non-supervisory and white collar/supervisory.[9] Such a breakdown is particularly important for rural areas since rural workers are overwhelmingly and disproportionately production workers (87.5 versus 81.2 percent in the nation as a whole), with relatively little access to higher skill/higher pay white collar jobs.

The data in Table 4 show results for change in GED job-skill requirements. These data show GED requirements for rural production workers (row 8) growing quite slowly

TABLE 4
The Effect of Industry and Occupation Employment Shifts on General Educational Development (GED) Skill Requirements, 1970-2000

Place and Occupation Level of Jobs	(1) 1970-79	(2) 1980-88	1988-2000 Based on BLS Projections (3) Equal Growth Scenario	(4) 1970s Growth Scenario	(5) 1980s Growth Scenario
		(Ten-Year Rates of Change)*			
National					
All Workers	2.3%	2.0%	0.8%	-	-
Production	2.1	1.8	0.9	-	-
Supervisory	1.0	1.7	0.5	-	-
Metro					
All Workers	2.2%	2.2%	0.7%	0.8%	0.8%
Production	1.7	1.2	0.8	0.8	0.9
Supervisory	1.6	0.7	0.5	0.5	0.5
Nonmetro					
All Workers	2.9%	1.1%	0.9%	1.3%	0.5%
Production	0.9	1.4	0.9	1.4	0.6
Supervisory	1.2	0.8	0.6	0.5	0.3

* To facilitate comparisons of these time periods which are of different length the data have been converted to ten-year rates of change: the change if the annual rate of change in these time periods had continued for ten years.

Source: Authors' calculations.

in *both* the 1980s and the 1970s.[10] And, as the data in columns 3, 4, and 5 indicate, future changes in the job structure are likely to keep skill growth for rural production (and white collar) jobs at the same very low levels as previous decades -- in fact, probably *lower*.[11] Thus, rural production workers, in particular -- the overwhelming majority of the rural workforce and the presumed chief target of an education-based, supply-push strategy -- seem very unlikely to experience the demand-side conditions appropriate to such a strategy.

The results for average years of education (Table 5) show the same pattern: very slow growth in educational requirements for rural production workers in the 1970s and 1980s to be succeeded, according to projection estimates, by even slower growth in the future. Data for other skill and education measures (not shown here) fully accord with

TABLE 5
The Effect of Industry and Occupation Employment Shifts on Years of Schooling Required, 1970-2000

Place and Occupation Level of Jobs	(1) 1970-79	(2) 1980-88	1988-2000 Based on BLS Projections (3) Equal Growth Scenario	(4) 1970s Growth Scenario	(5) 1980s Growth Scenario
		(Ten-Year Rates of Change)*			
National					
All Workers	1.4%	1.1%	0.5%	-	-
Production	1.3	0.8	0.5	-	-
Supervisory	0.6	1.3	0.3	-	-
Metro					
All Workers	1.3%	1.2%	0.5%	0.5%	0.5%
Production	0.8	0.7	0.5	0.5	0.5
Supervisory	1.2	0.5	0.3	0.4	0.3
Nonmetro					
All Workers	1.9%	0.4%	0.6%	0.9%	0.3%
Production	0.3	0.8	0.6	0.9	0.4
Supervisory	0.8	0.6	0.4	0.1	0.2

* To facilitate comparisons of these time periods which are of different length the data have been converted to ten-year rates of change: the change if the annual rate of change in these time periods had continued for ten years.

Source: Authors' calculations.

this picture: future growth in job-skill requirements for the bulk of the rural workforce will be sluggish at best, almost non-existent at worst.

And the picture gets worse when we turn to the data on pay levels by type of worker (Table 6). According to these data, the effects of industrial and occupational change on the weekly compensation of rural production workers were *negative* throughout the 1970s and 1980s (-2.8 and -1.2 percent, respectively), negative effects that appear likely to continue into the future. For example, under the relatively optimistic equal growth scenario, weekly compensation for rural production workers is projected to go down at a ten-year rate of 0.8 percent, while under the more realistic "1980s growth" scenario, weekly compensation will fall even faster, at a 1.2 percent rate. Thus, not only are rural production workers likely to face weak demand for worker skills, they are also likely to face downward pressure on their pay levels from the effects of structural change.

TABLE 6
The Effect of Industry and Occupation Employment Shifts on Weekly Compensation, 1970-2000

Place and Occupation Level of Jobs	(1) 1970-79	(2) 1980-88	1988-2000 Based on BLS Projections (3) Equal Growth Scenario	(4) 1970s Growth Scenario	(5) 1980s Growth Scenario
		(Ten-Year Rates of Change)*			
National					
All Workers	2.2%	0.6%	-0.2%	-	-
Production	0.9	-1.0	-0.4	-	-
Supervisory	1.8	2.8	0.4	-	-
Metro					
All Workers	2.0%	1.3%	-0.1%	-0.1%	0.1%
Production	-0.4	-0.4	-0.3	-0.5	-0.2
Supervisory	2.7	0.5	0.3	0.8	0.4
Nonmetro					
All Workers	3.1%	-2.5%	-0.5%	0.2%	-1.3%
Production	-2.8	-1.2	-0.8	0.4	-1.2
Supervisory	0.7	0.9	0.6	-1.4	-0.3

* To facilitate comparisons of these time periods which are of different length the data have been converted to ten-year rates of change: the change if the annual rate of change in these time periods had continued for ten years.

Source: Authors' calculations.

Conclusion

Our analysis suggests that an education-based, supply-push approach to rural economic development should be viewed skeptically. The most serious obstacle to rural economic development may, in fact, be on the demand side. Efforts to upgrade worker skills by themselves seem unlikely to pay off since the availability of high-skill jobs in rural areas will, at best, increase only slightly.

There are alternative interpretations of our data, however, that may yield a more optimistic viewpoint. The first is that, while shifts in the *distribution* of occupations will not affect job-skill levels, upgrading *within* occupations or job *content change* may (this is the third possible dimension of change in the job structure, as discussed in the second section). Such a development would allow strong growth in skill demand.

For example, if computers are now employed extensively within an occupation (say, clerical or bank teller), where they were used not at all fifteen years ago, then the

average skill level in that occupation may have changed dramatically over the fifteen-year period. If the number and magnitude of these within-occupation (content) changes are sufficiently high, then substantial skill upgrading could be taking place within the economy, even while the effects of structural (distributional) changes are modest, as we estimated in the previous section.

The problem with this line of argument is that analysts do not know the amount of content change in the recent past, nor do they have a clear idea of how much is likely in the future. While surveys like the decennial Occupational Employment Statistics (OES) decennial and the Current Population Survey (CPS) track changes in industry/occupation distributions, changes in job content are not monitored nearly so closely. For example, while the CPS is done monthly and even the OES is conducted on a three-year cycle, there has been no new fully revised edition of the Dictionary of Occupational Titles -- the only survey that tracks job content -- since 1977.

Nor does the case study literature provide a clear window onto the direction and magnitude of within-occupation change. It does not say, for example, that where technological changes within occupations have been large, there have been equivalent rises in skill levels. In fact, the change in employment patterns due to a given technology can vary from large increases in skill levels, to small increases, to none at all, or even to *downgrading* (Spenner, 1988). For example, studies of flexible manufacturing systems show similar technologies being deployed in quite different ways in different countries (Jaikamur, 1986).

This suggests that the magnitude of recent job content change cannot be estimated with much precision and that therefore one should be cautious in assessing the amount of content change in the future. Nevertheless, overlap between three sources of information -- the scholarly literature, journalistic accounts, and the accumulating testimony of the nation's business community -- allows some limited conclusions to be drawn.

First, jobs today are more likely to require at least threshold levels of literacy and numerical skill. Second, some jobs in "best practice" firms within certain industries are being substantially upgraded (for example, workers independently solve technical problems, learn new tasks on a fairly regular basis, interact with fellow workers as part of a "team"). Third -- and perhaps most importantly -- such "best practice" firms are *not* the norm in the U.S. economy today (though they are becoming more numerous over time).

Our assessment of modest current change in the skill content of jobs is supported by a recent survey of employers conducted by the Commission on the Skills of the American Workforce (1990). This survey found that only 5 percent of American employers believe education and skill requirements of jobs are rising significantly, while 80 percent say their primary concern is finding employees with a good work ethic and appropriate social behavior. Thus, while massive change in the content of jobs cannot be ruled out, there is little justification for making such an assumption at this time.

The second optimistic interpretation of our data assumes that skill demand and supply are so intertwined that skill supply can, in essence, create its own demand. Thus, if skill demand is currently rising slowly (as our data suggest), then the solution is to increase skill supply rapidly (by pushing up educational levels), thereby encouraging employers to raise job skills rapidly. This will lead, proponents argue, to generally higher skill demand.

Skill supply and demand seldom equilibrate so nicely, however. In fact, the historical and empirical literature is filled with examples of the relative independence of skill demand and supply. Employers' decisions on workplace skill levels appear to be quite complicated, responsive to a range of factors that includes the skill levels of available workers, but is by no means limited to that. Variation in contemporary U.S. workplaces underscores this point, with certain firms (Motorola, NUMMI, Honda) using relatively high-skill forms of work organization, while employing workers with quite ordinary skill levels. In light of all this, the idea that the true key to increased skill demand is a simple increase in skill supply seems untenable.

The final optimistic interpretation of our data is based on the various wage studies that show the economic returns to education and "skill" rising substantially in the 1980s. For example, the wages of college-educated workers increased while the wages of high school graduates fell, suggesting that employers now attach a greater value to education. It has also been suggested that increased wage inequality among workers of equivalent education and experience indicates an increased return to unmeasurable "skills." Clearly, these wage trends are market signals of some kind that employer demand is shifting away from less educated, unskilled workers. But, careful studies of these wage trends have concluded that, whatever the nature of this change in relative demand, the demand shifts have been steady over time, not explosive. Moreover, since these trends did not continue from 1987 to 1990, it may mean that this demand shift has been met with increased

supply. Finally, it is a mistake to ascribe all of the changes in the wages of college-educated workers relative to other workers to rising skill levels of jobs, since many other factors -- the shift to low-paying industries, deunionization, international trade, etc. -- have played an important, if not dominant role, in driving these wage trends.[12]

Is there any further role for education? Yes, in two ways. First, more education generally does help *individuals* in rural areas. However, the literature is also clear that more educated individuals are more likely to migrate out of rural areas (McGranahan and Ghelfi, 1991). Thus, more education could have the paradoxical effect of helping rural *individuals*, but hurting rural *areas*.

Second, if economic circumstances change, rural areas could benefit substantially from higher education levels. This would be the case if the U.S. economy moves onto a "high-skill, high-wage" path during the 1990s, instead of continuing the economic course of the 1980s.[13]

In such circumstances, rural educational upgrading could make sense, but only if coordinated with policies for boosting rural demand for high-skill workers.[14] Such policies might include, for example, making rural areas more "urban-like" by providing the information infrastructure needed to support the relatively high-skill sectors of the economy.

This suggests that in rural areas, as indeed in the nation as a whole, the great challenge is to focus on the demand side of the equation: how can we affect the mix of available jobs. Obviously much more discussion and policy attention needs to be devoted to this matter. But, whatever the policy specifics, demand-oriented policies stand a better chance, in the long run, of helping rural areas prosper than a single-minded focus on upgrading the educational levels of rural workers.

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APPENDIX

Industrial and Occupational Data

Industrial/occupational shift effects were estimated from a shift-share analysis of a twenty-three by twenty-three industry/occupation matrix for the years 1970-2000. The twenty-three industrial categories were: (1) agriculture; (2) mining; (3) construction; (4) textile and apparel manufacturing; (5) other routine manufacturing by small firms; (6) other routine manufacturing by large firms; (7) complex manufacturing by small firms; (8) complex manufacturing by large firms; (9) transportation, utilities, and communication; (10) wholesale trade; (11) eating and drinking places; (12) all other retail trade; (13) finance, insurance, and real estate; (14) business and repair services; (15) entertainment, recreation, and personal services (except private household); (16) private household; (17) public hospitals; (18) private hospitals; (19) other health services; (20) public education; (21) private education; (22) professional services (except education and health); and (23) government (except public hospitals and education).

The occupational categories were: (1) managerial and administrative; (2) management support; (3) elite professionals; (4) engineering and mathematics; (5) other professional specialty; (6) technicians and related support; (7) sales supervisors and proprietors; (8) sales representatives; (9) sales workers; (10) secretaries and typists (11) information clerical, computer, and peripheral equipment operators; (12) other clerical; (13) private household; (14) protective services; (15) food and cleaning services; (16) health and personal services; (17) farm, forest, and fisheries; (13) mechanics and repairers; (19) construction and extractive; (20) precision production; (21) machine operatives; (22) transportation occupations; and (23) handlers, helpers, and laborers. Details on definitions of all industry and occupation categories are available from the authors.

For all industry/occupation categories, employment counts were based on wage and salary employment in that category (i.e., the self-employed (unincorporated) and unpaid family were excluded). For the historical analysis, employment counts for 1970 were obtained from the 1970 Census, 1979 counts from the March 1979 *Current Population Survey (CPS)*, 1980 counts from the 1980 Census and 1988 counts from the 1988 *CPS* Earnings files. For the projections (future) analysis, employment counts for 1988 and 2000 were obtained from the 1988-2000 Bureau of Labor Statistics (BLS) employment projections.

Since the 1970 and 1979 data files use the 1970 Census industry and occupation classification systems, the 1980 and 1988 data files use the 1980 Census classification systems and the 1988-2000 data file use the 1988 Occupation Employment Statistics (OES) classification systems, it was necessary to construct a crosswalk linking our industry and occupation categories across the three coding schemes. Details on this crosswalk, as well as various adjustments made to deal with ambiguous codes within the different classification systems, are available from the authors.

It was also necessary to break down employment counts for each industry/occupation category into metro and nonmetro employment counts for that category. For the historical data, we used the metro and nonmetro identifiers built into the data files to generate metro and nonmetro counts within each category. Unclassified (i.e., not identified as either metro or nonmetro) cases from the 1979 and 1988 *CPS's* were allocated as metro and nonmetro following the procedure described in the Appendix to McGranahan and Ghelfi (1991).

To generate 1988 metro/nonmetro employment counts for the projections (future) data, we first derived metro/nonmetro proportions for each industry/occupation category from the 1988 *CPS* Earnings file. We then applied these proportions to the 1988 counts for each category contained in the 1988-2000 projections data.

Finally, since metro/nonmetro classifications changed between the 1980 Census and the 1988 *CPS*, it was necessary to adjust the 1980 metro/nonmetro employment counts to reflect this change in classification. We did this by subtracting 4.7 percent of total nonmetro jobs in 1980 and adding them to metro jobs. For the precise procedure used to adjust each industry/occupation category, see Appendix, McGranahan and Ghelfi (1991).

Pay Levels

Hourly and weekly wage data were derived from the 1988 CPS earnings file (here, as elsewhere, 1988 was the year we "standardized" on for our shift-share analyses). For each industry/occupation category, we simply computed the mean hourly and weekly wage within that category.[15] Information on fringe benefits by industry from the Bureau of Economic Analysis and by occupation from the Bureau of Labor Statistics were used to construct hourly and weekly compensation data.

Skill Indices

All skill indices in this report are taken from the *Dictionary of Occupational Titles (DOT)*, a compendium of occupational titles in common use in civilian U.S. labor markets. The compendium is based on survey information collected at irregular intervals by job analysts for the U.S. Employment Services. A variety of information about each occupational title is contained in the *DOT*, including ratings of the educational development, training time, physical capabilities, temperaments, and aptitudes necessary for the job. (For more information on how these ratings were constructed, including formal definitions and coding schemes, see the *Handbook for Analyzing Jobs* (U.S. Department of Labor, 1972).) There have been four editions of the DOT: 1939; 1949; 1965; and 1977 (a fifth edition with only partial revisions was released in 1991). The last of these contained information on some 12,855 different occupations.

The skill ratings for occupational groups in our analysis were based on scores from the 4th edition. The specific indices we used from this edition were the three worker functions (handling data, people, and things), the three worker aptitudes (intellectual, verbal, and numerical) and the general educational development measure (GED) (see Miller, Treiman, Cain, and Roos (1980) for useful discussions of each of these measures).

We aggregated from detailed DOT titles to our industry/occupation categories in the following manner. First, 4th edition scores for three-digit 1980 Census occupational codes were obtained from the Inter-University Consortium for Political and Social Research (ICPSR) data set put together by England and Kilbourne (1988). (For the tangled history of how 4th edition scores were weighted into 1980 census codes, see England and Kilbourne, 1988, as well as Miller, et al., 1980, Appendix F). These scores were then attached to data from the 1988 CPS Earnings file. We then obtained scores for our industry/occupation categories by simply taking the mean skill score for cases within each category of the Earnings file.

Educational Levels

The educational requirements of industry/occupation categories are based on the educational levels of incumbents. These were drawn from 1988 CPS Earnings file data. For each category, we generated the mean years of education for that category, as well as the proportion of workers in that category who were high school dropouts, high school graduates, had some college, or were college graduates.

Endnotes

1. In this paper, the terms "rural" and "nonmetro" are used interchangeably, as are the terms "urban" and "metro."

2. See Appendix for discussion of BLS employment projections as a data source and methodology used to analyze it.

3. See Appendix for discussion of methodology and data used to perform these analyses.

4. Handling data and numerical aptitude, however, are exceptions. They show a slight acceleration in growth rates in the 1980s.

5. In an earlier analysis (Mishel and Teixeira, 1991), we looked at growth in income, wages, and compensation implied by the BLS projections as a whole (not just projected shifts in the job structure). We found that, even taking these economic projections at face value, future growth in pay levels will be sluggish and, therefore, highly unlikely to remedy the income problems that afflicted the vast majority of the workforce in the 1980s. See Mishel and Frankel (1991) for a detailed discussion of these problems.

6. Handling data and numerical aptitude are, again, exceptions, as are the shares of employment requiring some college or a college graduate. Growth in these job-skill measures accelerated slightly in the 1980s.

7. The GED actually consists of three components: language, mathematics, and reasoning. As a check, we broke the GED down into its components and estimated separate shift effects for each component. The basic pattern of results summarized above was obtained for each one.

8. Average years of education and share of employment requiring a college education are exceptions. They would increase slightly under this scenario.

9. For definitions, see Appendix.

10. Interestingly, the data actually show faster skill growth in the 1980s than the 1970s, despite the sharp overall slowdown (row 7) in skill growth in rural areas in the 1980s. This reflects an overall shift within rural areas from relatively high-skill/high-pay white collar jobs to relatively low-pay/low-skill production jobs, thereby damping down overall skill growth. This, in turn -- as pointed out by McGranahan and Ghelfi (1991), and supported by our own analyses -- has a great deal to do with the tendency of these relatively high-skill white collar jobs to shift from rural to urban areas in the 1980s.

11. The exception is the 1970s growth scenario, where projected future growth is a little faster than the historical rate from the 1980s. But this scenario is also the least likely of the three scenarios sketched in this section.

12. Though these wage trends do appear to indicate that we need to increase the proportion of the workforce with a college degree, probably from 25 to 30 percent.

13. See Mishel and Teixeira (1991), p. 40-42, for a discussion of the high-skill, high-wage path and how such a path would differ from current U.S. practices.

14. Mishel and Teixeira, op. cit., also contains a discussion of appropriate demand-side policy options, albeit pitched at a national level.

15. Due to computational difficulties, we used the truncated or "Windsorized" mean for topcoded data. Further details on our analysis of Earnings File wage data are available from the authors.

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